Measuring the effects of aircraft overflights on recreationists in natural settings

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CONTENTS

Abstract

Part 1 is a detailed implementation guide which explains a monitoring system designed to assess the effects of aircraft activity on recreationists in natural settings. A visitor questionnaire survey is the monitoring method. The questionnaire is designed to be administered on site by a Department of Conservation staff member from the relevant local field office. Remote areas, however, will be surveyed via questionnaires left in huts and other places of visitor contact. The questionnaire includes questions pertaining to a range of indicators: general likes and dislikes, whether aircraft were noticed during the visit, number of aircraft noticed during the visit, experience compared with expectations, estimate of aircraft threshold level, reaction to aircraft (positive, negative, or neutral), extent of annoyance, and extent to which aircraft have affected total visit enjoyment.

Data may be analysed using a computer spreadsheet programme. A customised spreadsheet has been designed for this purpose. Where possible, aircraft activity records will be collated from control tower records and/or airline company records, thus visitor reactions may be related to the frequency of flights.

Part 2 outlines the issues and concepts explored during the development of the monitoring method, the evaluation of potential approaches, and the prospects for future research on aircraft overflight impacts.

Qualitative methods (semi-structured interviews) were utilised to examine the effects of aircraft overflights on recreationists. Interviews were undertaken with visitors at two field sites, Mount Cook National Park and the Milford Track, Fiordland National Park. The interview data are supplemented by information already available from the literature.

Part 1 Measuring the effects of aircraft overflights on recreationists

1. Introduction

1.1 PURPOSE AND SCOPE

Part 1 presents a method for monitoring the effects of aircraft on recreationists in natural settings. It has been prepared for the Department of Conservation (DOC) to assist with the gathering of visitor information. The research upon which this monitoring method is based is reported in Part 2.

The method presented here has been designed to fit within DOC's operational system and be implemented in the field, at the local level. Of necessity, it is logistically simple to implement. This requirement has resulted in a method that is selective in the indices measured so as to be implementable by departmental personnel within existing cost structures.

As a monitor, the primary purpose of this method is to gauge change in recreationists' reactions to aircraft over time. To this end, monitoring should be undertaken on a regular basis. The method will also provide a 'baseline' measurement of severity of aircraft impact for a given site. The monitoring system may be established as a national system of aircraft impact indicator sites, and/or used at specific sites as required.

1.2 WHY MONITOR?

The management issue associated with aircraft relates to the tension between providing a wide range of recreation opportunities within limited geographic areas. As the number of aircraft overflying parks continues to increase, the potential for conflict between ground-based recreationists and those seeking experiences from the air is likely to be exacerbated. Changes in aircraft numbers and/or technology, the number and type of visitors, and management responses and regulations all have an effect on this issue. In order to manage aircraft use effectively, visitors' reactions to aircraft need to be identified and measured. In particular, visitor responses need to be measured over time to identify changes in reactions to aircraft. This report outlines a monitoring exercise which is designed to achieve this end.

2. Outline of the monitoring method

The monitoring method is a visitor questionnaire survey. The method focuses on asking recreationists their reactions to aircraft on-site, that is, during their visit to the conservation area. A short self-administered questionnaire is used to ascertain this information. It should take about four minutes to complete. In high-use areas, the questionnaires will be distributed by staff who wait while visitors fill them in. A group of people may fill in the questionnaire at the same time—each person completing a separate questionnaire. This approach ensures that 100% of questionnaires are returned and so non-response bias is minimised. Additional information may be picked up from respondents in conversation. This information should be noted, and may provide useful insight into the data collected. In remote areas, where the deployment of staff is not cost-effective, questionnaires will be left in huts, at road ends and other DOC facilities for staff to collect or visitors to complete and return by mail or in person. This approach is likely to result in biased results because only some people will fill in a questionnaire. This bias should remain constant over time and therefore the collection of data in this manner on a regular basis will produce a meaningful monitor.

The questionnaire comprises questions concerning:

- *General likes and dislikes.* Purpose: to assess the frequency of mentions of aircraft, in order to provide a context for aircraft impacts compared with other aspects of visitor satisfaction.
- *Whether aircraft were noticed during the visit.* Purpose: (1) filter question. Those people who have not encountered any aircraft will conclude the questionnaire at this point. (2) defines aircraft as helicopters and fixed-wing aeroplanes.
- *Number of aircraft noticed during the visit.* Purpose: to measure the number of aircraft noticed by respondents. Visitors will be influenced by the amount of activity that they noticed, not the actual number of aircraft flying.
- *Experience compared with expectations*. Purpose: to indicate how their experience related to their expectations.
- *Estimate of aircraft threshold level.* Purpose: to determine the relative amount of aircraft activity that would significantly spoil the recreationist's experience. This is one gauge of tolerance to aircraft.
- *Reaction to aircraft—positive, negative, or neutral.* Purpose: (1) to provide a basic monitor of visitors' reactions. (2) Filter question. To identify those annoyed by aircraft, so they may answer later questions.
- *Extent of annoyance.* Purpose: to provide a more detailed measure of visitors' annoyance levels.
- *Extent to which aircraft have affected total visit enjoyment.* Purpose: to provide a monitor of visitors' reactions to aircraft in the wider context of total visit satisfactions.

A copy of the questionnaire is included in Appendix 1. Data from the questionnaire can be analysed using a simple spreadsheet programme such as Excel. A customised spreadsheet is presented in Appendix 3.

Aircraft flight records will be collated in areas where there are identifiable airports which service the area (tower records) or a small number of operators (company records). The frequency of flights can be then related to visitor reactions. Appendix 2 is an example of an aircraft activity record for a survey period.

A mock-up monitoring report is presented in Appendix 4, illustrating interpretation of the data produced by the monitor.

Recreationists who have not visited a particular conservation area because they were put off by aircraft are not covered in the monitor. We suggest that further research is warranted to identify the extent to which this displacement and self-selection occurs as a result of aircraft. To achieve this, it may be most productive to target those who are most likely to be avoiding areas because of aircraft activity. Avenues worth exploring include members of tramping/outdoor activity clubs and visitors to DOC facilities/offices. A survey of the New Zealand population is not cost-effective given the high number of people who do not visit parks on a regular basis.

To target international visitors, the International Visitors Survey may be useful. This survey is commissioned by the New Zealand Tourism Board and collects information from visitors at airports as they leave the country. To make this approach cost-effective, we suggest asking general impacts questions, rather than specific aircraft impacts questions. Thus information wider than the aircraft issue would be collected.

3. Guide to implementing the monitoring system

This section describes how to implement the on-site monitor. Sections 3.1–3.4 apply to all areas, whether they receive high visitor use, or are remote or little used. Sections 3.5–3.8 are relevant only for high-use areas, while section 3.9 refers to remote and little visited areas. The approach described in sections 3.10 onwards is appropriate to all areas.

3.1 CHOOSE THE MONITORING AREA

Where should the monitor be implemented? In short, wherever it will be useful for management purposes. A variety of ways to assess appropriate areas may be used. For example, field managers may have concern about aircraft activity in an area or visitor complaints and records (such as hut book entries) may indicate visitor reactions that warrant investigation.

3.2 CHOOSE THE MONITORING SITES

Select the site(s) where monitoring will take place within each monitoring area. These are the places you believe you will be able to survey people within the area who will have been exposed to aircraft overflights. One site may be sufficient or different sites may be chosen to ensure responses from different types of people.

Example:

Area is: Mount Cook National Park
Sites are: Blue Lake car park (general visitors)
Alpine Club Hut outside the village (climbers).

A small number of sites should be selected for ongoing monitoring—one site will be sufficient in many areas. These sites will be monitored on a long term basis. Note that the nature of the environment alters responses, thus, once chosen, these sites should not be altered. Reactions measured within highly modified environments are likely to be more tolerant of aircraft than measurements taken within natural and wilderness settings. The choice of sites for the monitor therefore will affect the nature of the response.

Monitoring sites will primarily be at road ends and built-up areas (e.g. visitor centres in villages), backcountry huts, and exits from remote areas. Taking each of these areas in turn:

- Road ends/built-up areas—choose sites where a representative range of visitors will be encountered
- Backcountry huts—where resident, hut wardens can be utilised to conduct the questionnaire in the evenings
- Remote area exit points—focus primarily on sites where you will contact people leaving remote areas. These may be road ends or club huts for example.

Choose sites with a greater likelihood of contacting visitors who are completing their visit rather than those who have just arrived (and therefore have not been exposed to aircraft activity in the area).

3.3 PREPARE QUESTIONNAIRES

A copy of the questionnaire is presented in Appendix 1. Be as specific as possible in describing the area in which you are interested (e.g. Routeburn Track, Fox Glacier). Ensure an appropriate instruction for the return of the questionnaire is printed at the bottom of the last page (this will depend on whether you are surveying in a high-use area with interviewers or in a remote area). Note that the questionnaire is designed to be printed on to A4 paper and then folded to form an A5 questionnaire. This helps to hide Question 3 onwards from people, so the references to aircraft will not influence their responses to Question 1 and Question 2.

Choose an appropriate target number of questionnaires for the area and print this number of questionnaires. Around 400 questionnaires is good for high-use areas; fewer questionnaires are likely to be collected in remote areas (perhaps

50–100). Your target number of questionnaires will be obtained across different sites, if more than one site has been chosen to cover the area. Try to collect the number of questionnaires from the different sites in rough proportion to the amount of use they receive. For example, for Blue Lake car park and Unwin Hut, if Blue Lake receives far more use than Unwin Hut, you may try to collect about 90% of questionnaires from Blue Lake and the remaining 10% from Unwin Hut. Use whatever visitor data you have available to you as a guide.

Example:

400 questionnaires for Mount Cook National Park

- 90% of use captured at Blue Lake—collect approximately 360 questionnaires from Blue Lake
- 10% of use captured at Unwin Hut—collect approximately 40 questionnaires from Unwin Hut

The choice of sample size is a trade-off in cost versus accuracy. The greater the number of questionnaires, the lower the error margin. A sample size of 400 will give an error margin of ±4.9% on the final results. As a guide, the error margin for different sample sizes is given below:

SAMPLE SIZE	ERROR MARGIN
50	±13.9 %
100	±9.8 %
200	±6.9 %
300	±5.7 %
400	±4.9 %

Insert an identifier onto the questionnaire in the top right corner. This should be a conservancy abbreviation of two letters or numbers and a site identifier of two letters or numbers. These can be printed on to the questionnaires in bulk. Record the code given to each site on file.

Prior to distribution, write on to each questionnaire its individual identifier—a number of three digits. The questionnaire number should be sequential and start at 001 (through to 400 or whatever). Preferably keep the questionnaires in this order on your files once they've been completed, so it is easy to search for a specific number later if necessary. Thus each questionnaire will have a unique number. It doesn't matter if numbers are missed out in the sequence. It is simply an identifier.

Example:

Milford Track survey (there are two survey sites, one being Dumpling Hut, the other, Quentin Hut)

SO DU 001	Questionnaire 1 from Dumpling Hut, Southland Southland conservancy code: SO Dumpling site code: DU Questionnaire number: 001
SO QU 234	Questionnaire 234 from Quentin Hut, Southland Southland conservancy code: SO Quentin site code: QU Questionnaire number: 234

Example:

Whakapapa skifield (only one survey site)

TO WH 001	Questionnaire 1 from Whakapapa Skifield
	Tongariro/Taupo conservancy code: TO
	Whakapapa skifield site code: WH
	Questionnaire number: 001

3.4 CHOOSE THE MONITORING PERIOD(S)

Monitoring needs to take place during periods of aircraft activity to ensure that visitors are likely to encounter aircraft during their visit. The monitoring period(s) chosen will depend on the purpose to which the monitoring data will be put. For example, you may decide to focus on the peak period(s) of aircraft use. This may be one specific time of year, or may occur several times during the year. In your decision-making, consider high/low times of aircraft usage and high/low times of visitor use as well as types of use. In many cases, one period of the year will be sufficient, usually during the time of peak use.

Having chosen the time(s) of year in which you want to measure aircraft use, monitoring will take place during this time(s) each year. If the selected monitoring period(s) is more than one or two weeks, you need to select a specific week in which to undertake the monitoring (e.g. the first week in January; the week before and including Easter).

If you are monitoring at different times of the year (e.g. once in peak summer and once in peak winter use periods), it may make sense to select different sites for each monitoring period. For example, sites monitored in the first week of January may be under snow during the chosen winter period. Once chosen, the monitoring sites and monitoring periods must not change from year to year, otherwise these changes are likely to influence the data. This is important.

Sections 3.5–3.8 discuss the approach for areas with high visitor usage. For remote areas, or areas of low visitor use, please go to Section 3.9.

High-use areas only

3.5 SELECT MONITORING DAYS

Choose days within the chosen survey week on which the maximum number of aircraft are likely to be flying. In most cases, this decision will be largely determined by the weather. You may choose part days (for example, the weather may deteriorate during the day so you decide to discontinue surveying). Substitute the next part day of the same time period you missed (i.e. if you missed an afternoon, choose another afternoon). You should cover all times of day when visitors may be around. At different times of day, you are likely to encounter different types of people. Follow the principle of trying to interview a wide range of types of people (different nationalities, activities, ages, and so on).

This approach means that one needs to be flexible about the choice of monitoring days. For example, do not preplan to undertake the monitoring on 2

January. Instead, plan to undertake the monitoring during the week starting 2 January on the first fine weather day. If the survey week you have chosen suffers from very poor weather and, as a result, little aircraft activity occurs, spill the survey period over into the next week. The time spent in the field collecting questionnaires should coincide with the period during which the majority of visits takes place (e.g. 10 am until 5 pm). Very low levels of use do not justify the cost of keeping someone on-site.

3.6 SELECT AND BRIEF THE SURVEY INTERVIEWERS

Ideally permanent staff within the DOC office will undertake the monitoring. All interviewers should be fully briefed. The briefing should cover:

- How to introduce yourself and the study. Do not tell respondents that the survey is about aircraft. The first questions are contingent on visitors not knowing that we are only interested in aircraft. A suitable introduction would be: '*Hi, I'm . . . from the Department of Conservation. Would you mind filling in a short questionnaire for me? It's about your satisfaction with your visit to [NAME AREA]. It'll take less than five minutes.'*
- Because visitors should not be pre-warned that the survey is about aircraft, take care not to publicise the survey in a way that visitors will understand its primary purpose.
- Avoid leading the respondents. This means that you should not make suggestions of how they may respond or in any way lead them to answer in a particular way. Don't let your own views influence your tone of voice or manner if discussing aircraft with respondents. You must remain neutral about the issue.
- Avoid respondents reading over all the questions first before answering. This was not a problem during questionnaire testing nor in a previous survey of this type, but it may happen occasionally. This would lead to the respondents identifying our interest in aircraft before filling in Questions 1 and 2, which we don't want. If respondents look like they are reading all questions first, ask them not to.
- Encourage everyone to fill in a questionnaire, irrespective of their nationality, activity, whether guided or not guided and so on. Try not to select only one type of visitor (it's easy to do so without realising it). If the person's English language skills are insufficient for the task, then do not pursue their involvement. Similarly, if the person is too young to understand the questions and answer them then do not pursue. For this purpose a cut-off age of under 12 is suggested (i.e. those 12 years old and above are suitable).
- If necessary, assure respondents that their answers will be treated confidentially and will be summarised so that they cannot be individually identified. In many cases this won't be necessary.
- You may be asked for more information about the survey. In your response remember not to mention aircraft specifically but talk about visitor satisfactions. You may like to mention that the information will be used for park management purposes.

- You may need to reassure some people that you DO want their answers; their opinions are important.
- Check the questionnaires when they're handed back to you. Look for missed questions and for questions where more than one box has been ticked. All questions should have only one box ticked.
- When people hand back their questionnaire, thank them.
- Record any information about aircraft given by respondents in conversation.

3.7 COLLECT FIELD RESOURCES

You will need to take into the field:

- Questionnaires
- Sufficient pens or pencils
- Clipboards or something for visitors to write on
- Pen and paper on which to take your own notes—a separate notebook for the survey may be useful.

3.8 ADMINISTER THE QUESTIONNAIRES

Mark the date (e.g. 2-1-98) in the top right corner of the questionnaires before you go into the field. Don't expect visitors to do this—we should minimise the amount of work required from them.

On site, the interviewer should approach groups of visitors as they pass. Ask every member of the group to fill in a questionnaire. Where groups are very large (say a bus load), choose only a 'reasonable' number of people (e.g. 10 out of 45). There is no 'hard and fast' rule on this—use your common sense. Collect the questionnaires as the visitors finish writing. Hand out questionnaires to other people while one group is writing; several people can fill in questionnaires at the same time. Each person should fill in a questionnaire as an individual—we don't want group responses on one questionnaire. Aim to cover as many people as possible, although at times it will be impossible to survey everyone. Try to include a wide range of visitor types: avoid selecting the same sort of people each time, for example, only men or young people or the leaders of groups.

Checking questionnaires is important—keep the number of visitors filling in questionnaires to a number that you can supervise adequately. Don't try to have them filled out in the quickest possible time. The quality of information will suffer.

If the visitor has just arrived, don't pursue the interview. They are unlikely to have had exposure to aircraft. This is difficult to judge and interviewers need to use common sense. If the person has already filled in a questionnaire at this site or another site in the area, thank them and don't pursue the interview. Similarly don't pursue an interview with a child who's under 12 years old—this age is chosen on the basis of understanding of the questions. Involvement is voluntary. If someone doesn't want to fill in the questionnaire, thank them and leave them. Record the number of refusals in your own notes—this is useful as

it provides an indication of the intrusiveness of the questionnaire on visitors' park experience.

Record any useful information you gain from conversations during administration in your own notes. People are likely to talk to you while they fill in the questionnaire. Take paper with you and write these comments at the time (or soon afterwards). You will quickly forget comments if they are not written down. This information may be useful supplementary data to help explain the results. The primary objective is to collect good data on the questionnaires—the additional information is of secondary importance and should not be undertaken at the expense of checking the questionnaires.

Continue the questionnaire administration until you have collected the number of questionnaires you identified in step 3.3 (say 400). This may take several days. Do not worry if you collect more than the required number of questionnaires.

At the conclusion of the survey work, hold a formal debriefing session and record the comments of the survey staff. This will assist with replicating the method in future years, as well as data interpretation.

Remote areas only

3.9 DISTRIBUTE QUESTIONNAIRES

For some areas the approach outlined in sections 3.5–3.8 will not be cost effective because a small number of visitors will be encountered over long time periods. Instead of administering questionnaires on-site via interviewers, in remote, or little used, areas strategically place questionnaires at points of visitor congregation and points where you will contact people leaving the area. These may be at track exits, road ends, car parks, huts and visitor centres (where visitors sign out). Where possible, arrange for the questionnaires to be picked up from these sites by staff. Make it clear to visitors where they should leave the questionnaires after completion (e.g. in a weather-proof box).

Where staff cannot collect the questionnaires, they will need to be dropped off or mailed back by visitors. Do as much as possible to encourage people to return the questionnaires. A stamped, self addressed envelope may help. Make sure you specify different ways to return the questionnaires—make it as easy as possible for the visitor to do so.

Keep a record of the number of questionnaires distributed and the number returned, so you can calculate the proportion returned (response rate). Keep careful records of the distribution approach, so it can be repeated for future monitoring.

This approach is likely to collect a bias sample. In other words, the people who fill in questionnaires are likely to be different to the people who don't—you are most likely to get people who feel strongly about aircraft filling in a questionnaire. The results need to be prefaced with this point. Collection of the data in the same manner each year will still be meaningful, as you can assume that this bias remains constant.

All areas

3.10 RECORD AIRCRAFT ACTIVITY

If it is easy to do, record the flight activity on the monitoring days (flight frequency by aircraft type). For remote areas, this will be for the total survey period (i.e. the period questionnaires were out in the field). You may do this via flight records from controlled airports. In some areas, where there is a small number of operators, you may obtain the flight records directly from the companies involved. However, in other areas flight records will not be easy to obtain owing to multiple flight paths from different directions. Trying to record aircraft movements in other ways (e.g. by personal observation) is not worthwhile.

Record the number of flights on an aircraft activity record sheet. An example is provided in Appendix 2.

3.11 ENTER DATA FROM QUESTIONNAIRES INTO A SPREADSHEET PROGRAMME

The data can be analysed using a spreadsheet programme. A model programme has been created using Excel for Windows. See Appendix 3 for an annotated example of the spreadsheet screen generated by this programme. Each monitoring period is treated separately in the analysis (e.g. questionnaires collected in a summer monitoring period are analysed separately to a winter monitoring period). Enter the data from different monitoring periods separately into the spreadsheet.

Data from each questionnaire take up one row of the spreadsheet. Each cell in the row is explained below, starting with the left cell.

Questionnaire identifier

Enter the code for the conservancy and site along with the questionnaire number into the first cell.

Question 1

First cell: Enter 0 if aircraft are not mentioned.
Enter 1 if aircraft are mentioned.

Second cell: Add up the total number of 'likes' mentioned.
Enter this figure.

Question 2

First cell: Enter 0 if aircraft are not mentioned.
Enter 1 if aircraft are mentioned.

Second cell: Add up the total number of 'dislikes' mentioned.
Enter this figure.

Question 3

Enter the number corresponding to the box that is ticked.
If more than one box has been ticked, enter NA (not applicable).
If no box has been ticked, enter NA.

If the *No* box was ticked (code 2) then the questionnaire should be discontinued at this point. Enter NA in all remaining cells. Do this even if the respondent has continued to answer questions.

Question 4

Enter the number of aircraft written on the questionnaire.
If no number is written, enter NA.

Question 5, 6, and 7

Enter the number corresponding to the box that is ticked.
If more than one box has been ticked, enter NA.
If no box has been ticked, enter NA.
Only people who ticked the *I was annoyed by them* box (code 3) in Question 7 should continue the questionnaire from this point. For people who answered otherwise (codes 1, 2, or 4), enter NA in all remaining cells. Do this even if the respondent has continued to answer questions.

Question 8 and 9

Enter the number corresponding to the figure that is circled.
If more than one figure has been circled, enter NA.
If a circle has been made between figures, enter NA.
If no figure has been circled, enter NA.

Keep a permanent copy of all data on disk, clearly labelled with the survey dates and sites.

3.12 ANALYSE DATA

Once data from all the questionnaires have been entered into the spreadsheet, analyses can be undertaken. For most questions, the spreadsheet calculates the frequency of mentions for each tick box/circle, or for Question 4, each number of aircraft. To do this, you enter the response category number in the appropriate cell (as shown in Appendix 3) and the spreadsheet calculates the total number of people who answered with that response category. For example, the total number of people who answered Yes to Question 3 will be shown when you enter a 1 (the code for Yes) in the Question 3 cell. Write this number down on a clean questionnaire next to the Yes box for Question 3.

Once you have completed this for all relevant questions (and recorded the frequencies on the clean questionnaire), you must calculate the percentages for each question. This can be done easily with a calculator by dividing the frequency for each response category by the total number of people who answered that question (the sum of all the responses).

The spreadsheet can also calculates a few other statistics. These are:

Questions 1 and 2

The total number of likes/dislikes mentioned (so the number of aircraft comments can be compared to the number of all comments).
The mean number of likes and dislikes.

Question 4

The total number of aircraft noticed (the computer calculates this so it can work out the mean)

The mean number of aircraft noticed.

Questions 8 and 9

The mean score.

Note that the questionnaire code is not analysed. This information can be used to identify a questionnaire if necessary. It is a unique descriptor for each questionnaire.

Analyse each monitoring period separately. Data from a Summer survey period, for example, is treated differently to data from a Spring survey period.

3.13 PRESENT THE RESULTS

In the simplest form, results can be presented as an annotated copy of the questionnaire. This is an easy way to immediately 'see' results. From these data, a monitoring report should be prepared, which compares these data with data from past years. Appendix 4 presents a mock-up monitoring report showing the type of results that the monitoring programme will produce. The report presents the data (taken from the annotated copy of the questionnaire) and interprets them.

3.14 INTERPRET THE RESULTS

Data are most useful when replicated over time. The monitor is established with this purpose in mind so data should be compared over time. Statistical testing is not part of the data analysis. For most results, the trend in the data is the most relevant analysis.

A critical result is the level of annoyance with aircraft, for which a limits of acceptable change philosophy is used. Question 7, 8, and 9 are the most appropriate indicators for this purpose. Data should be matched against an agreed 'acceptable' threshold of aircraft disturbance. The US National Park Service (NPS 1994) suggest a 25% annoyance level as an appropriate threshold, i.e. 25% of visitors registering annoyance with aircraft. Oliver (1995) adopts this threshold level in his West Coast glaciers research. Sutton (1996: 11) states that the 'exact point . . . chosen as an indicator for this threshold may need to be negotiated with those people that may have the most interest in such a choice.' Clearly the threshold is of paramount importance and must be chosen carefully. It may vary from site to site and should be discussed with relevant stakeholders. This may be best achieved prior to data collection. Once chosen, this threshold level of people annoyed with aircraft should be compared with the results of Question 7 (which gives the percentage of people annoyed with aircraft). In anticipation of reaching the threshold, management action could be predetermined and then undertaken when, and if, required.

Results from Questions 8 and 9 indicate the type and degree of annoyance. Strong annoyance is registered if the mean score for Question 8 is above 4. Comparison between the two question means will show the relative level of annoyance compared with the level to which aircraft detracted from people's visit. As for other figures, trends in these means over time will be a key measure.

Where more than one monitoring period has been established through the year, comparisons can be made between the periods, but the key results will be trends from year to year with respect to each period (e.g. data collected in January 1998 compared with January 1999; data collected in June 1998 compared with June 1999).

Remember that the final number of questionnaires collected will relate to a certain margin of error. For 400 questionnaires, the error margin for results is approximately ±4.9%. This error margin means that for a certain result, e.g. 50%, the real figure actually falls within a 9.8% range; for the example given, the real figure is between 45% and 55%. See section 3.3 for a list of error margins or calculate it yourself (see Appendix 5 for the formula).

For surveys undertaken in remote areas, the questionnaire responses are likely to be bias (probably against aircraft). You should identify this issue in the report. This makes the analysis of trends in the data particularly relevant—focus on changes in the data between years rather than the data themselves. It can be assumed that this non-response bias will remain constant over time.

3.15 RECORD ALL ASPECTS OF THE METHOD

To ensure exact replication of the approach in one years time, it is important to record all aspects of the monitoring method. Do this as part of the monitoring report. In particular note the monitoring period, monitoring days, exact monitoring sites, number of questionnaires collected, and any unusual aircraft activity or visitor patterns.

3.16 REPLICATE THE METHOD ON A REGULAR BASIS

In most cases, the monitoring method will be replicated on an annual basis. There may be good reasons for it to be less often, for example, every two years.

4. Summary

These guidelines outline a monitoring method which focuses on asking recreationists their reactions to aircraft during their visit to the conservation area. A short self-administered visitor questionnaire is used to ascertain this information. The questionnaires will be distributed by DOC staff who wait

while visitors fill them in. In remote areas or areas with low use, questionnaires will be distributed to points where visitors congregate (e.g. huts, track exits) and the questionnaires later collected by staff, or returned by visitors (dropped off or posted back).

The questionnaire comprises questions concerning:

- General likes and dislikes
- Whether aircraft were noticed during the visit
- Number of aircraft noticed during the visit
- Experience compared with expectations
- Estimate of aircraft threshold level
- Reaction to aircraft—positive, negative or neutral
- Extent of annoyance
- Extent to which aircraft have affected total visit enjoyment.

Aircraft flight records will be collated in areas where there are identifiable airports which service the area (tower records) or a small number of operators (company records). Some areas will not be able to collate aircraft data given their diverse pattern of aircraft activity.

The primary purpose of the survey is to collect information on an ongoing basis to identify changes over time. To this end, the method should be implemented on a regular, perhaps annual, basis.

Recreationists who have not visited a particular conservation area because they were put off by aircraft are not covered in the monitor. We suggest that further research is warranted to identify the extent to which this displacement and self-selection occurs as a result of aircraft.

Part 2 Effects on recreationists in natural settings

1. Introduction

1.1 PURPOSE AND SCOPE

Part 2 discusses findings from research into the effects of aircraft on recreationists in natural settings. The research was undertaken to develop the method for monitoring the effects of aircraft on recreationists, which is the subject of Part 1 of this volume.

The focus of this study, therefore, was to increase our understanding about aircraft effects on recreationists so that appropriate monitoring measures could be identified. This study deals specifically with the social impacts of aircraft overflights; it is not concerned with ecological or physical effects on the natural environment. Owing to the specific objective of the study, many potential research 'leads' were not pursued. Areas that warrant further research are noted in section 7.

1.2 PREVIOUS STUDIES—THE RESEARCH CONTEXT

Most research into the social impacts of aircraft has concentrated on urban settings associated with airport development and operations. This work has focused on *annoyance level* as the primary measure of social impact and this same approach has been adapted and applied by researchers in the context of natural settings. Work addressing aircraft effects in natural settings has been limited. The most notable studies have been undertaken within the United States by the United States Department of Agriculture, Forest Service (USDA 1992; Fidell et al. 1992; Tabachnick et al. 1994) and the United States National Park Service (NPS 1994). A major focus of these studies was the derivation of dose-response curves (i.e. graphical correlation between annoyance and noise). The purpose of this work was to predict the percentage of people annoyed from a known or estimated level of aircraft activity. The New South Wales National Parks and Wildlife Service also conducted a study in 1994 in the Blue Mountains, interviewing visitors and residents to ascertain reactions to aircraft noise (NSW National Parks and Wildlife Service no date).

Within New Zealand, DOC and its predecessors have investigated the issue of aircraft impacts, most recently with work undertaken in Westland (Oliver 1995) and at Mount Cook (Rogers 1995). These studies drew on the USA work and can be viewed as precursors to this research. Readers are also directed to two scoping reports on aircraft activity and impacts prepared by DOC (Sutton 1994; Sutton 1996).

While these studies examine various aspects of aircraft impacts, they do not address the question of monitoring such impacts. During the course of the present research no methods to monitor the effects of aircraft on recreationists were uncovered.

1.3 RESEARCH METHODS

The following methods were utilised.

1.3.1 Literature review and contacts

Using online databases, literature searches were conducted and promising references interloaned (databases searched included SSI, ERIC, INNZ, CAB Abstracts). Previous New Zealand studies were reviewed. Internet and electronic mail were utilised to contact *Leisurenet* subscribers (global electronic bulletin board for recreation research) and specific researchers and practitioners in several countries. Direct contact with authors of previous relevant studies was made where possible.

1.3.2 On-site interviews

Recreationists were interviewed at two field sites to illuminate aspects of the aircraft impacts issue that were unclear from the literature or that required testing in the New Zealand context. The two field sites were Mount Cook National Park (in and around the village and Blue Lake) and the Milford Track, Fiordland National Park. The sites were chosen in conjunction with DOC staff. In the semi-structured interviews, respondents were asked their general likes and dislikes about the area (to ascertain the relative importance of the aircraft overflights issue) and then in-depth about their reactions to aircraft. Responses are reported later in this report. In total, 59 people were interviewed, some in groups. A range of types of visitor were selected, including people on bus tours, free and independent travellers, guided and independent walkers, and both those who had taken a scenic flight/used air access and those who had not. Interviews were undertaken during February and March 1995.

1.3.3 Method testing

On-site testing of the draft monitoring method was undertaken on the Milford Track. The questionnaire was administered to 17 respondents. A detailed interview was then conducted with each respondent, talking to them about their responses to check for question meaning, comprehensibility and validity. Modifications were made in light of the knowledge gained from the tests.

1.4 REPORT OVERVIEW

This report examines the issues associated with monitoring the effects of aircraft on recreationists. It discusses the nature of impacts on recreationists (section 2) and examines different factors which influence these impacts

(section 3). These factors have strongly influenced the nature of the monitoring system that has been developed. Section 4 outlines key concepts about the measurement of effects of aircraft and leads into a discussion of the methodological development of the monitor, discussing the options available and why the final methods and measures were chosen (section 5). Section 6 briefly outlines the monitoring method that has been designed from this study. Detailed guidelines about implementing the monitoring system are provided in Part 1. Section 7 outlines areas that warrant further research.

2. Effects of aircraft overflights on recreationists

The nature of aircraft impact on recreationists is varied, and both positive and negative aspects are evident. Researchers in the present study were careful to remain neutral with respect to aircraft effects, despite some strong views expressed on the subject.

Direct effects upon visitors are both aural and visual. Both aspects have been investigated in previous studies and were examined also during this research. The literature indicates that noise is the primary effect (USDA 1992; NSW National Parks and Wildlife Service no date). This finding is supported by the present research which found that many visitors noted that aircraft they could see but not hear (such as gliders) were acceptable in natural settings.

Recreationists' perceptions of impact also influence their behaviour and enjoyment. This study found that perception of safety can be linked to two diverse reactions to aircraft. First, that the presence of aircraft, especially helicopters, is reassuring as 'help is at hand'—a positive effect. The US National Park Service study (NPS 1994) found that 10 percent of visitors interviewed in a postal survey reported that aircraft made them *feel safe* in case they needed rescue. Conversely, the present study identified a perception that aircraft distract the recreationist, putting them in danger (for example, missed footing). Additionally, there was a concern that the noise of aircraft may set off avalanches.

The perception of impacts may influence the recreationist's choice of location or destination. Self-selection (the decision not to visit an area at all) and displacement (the decision not to return to an area) are extreme forms of social impact. Those people who have already made the decision not to visit an area because of the presence of aircraft are not covered by the monitor.

Overseas research conclude that aircraft overflights produce 'few adverse impacts to wilderness users . . .' (USDA 1992: 2–22). Within the present study, visitor dissatisfaction with aircraft overflights was often secondary to other park concerns (for example, poor signage, conflicts with other recreationists).

3. Factors influencing recreationists' reactions to aircraft overflights

Recreationists' reactions to the effects of aircraft vary, and are dependent on a range of factors. The literature suggests a number of influencing variables and the interviews undertaken at the two field sites provide some useful insights. This section reports on the factors which are associated with recreationists' reactions to aircraft. Note that this area of research is still developing and consequently many research questions can be identified from this discussion which warrant further investigation.

3.1 ATTITUDES TO AIRCRAFT OVERFLIGHTS IN NATURAL AREAS

Behavioural theory suggests that individuals' attitudes influence their satisfaction with a recreational experience (Moore 1995). Recreationists' attitudes to aircraft in natural areas are therefore likely to affect their reactions to, or satisfaction with, aircraft exposure. For example, Oliver (1995) found that 6% of respondents indicated they were annoyed with aircraft during times when no aircraft movements were recorded. Sutton (1996) suggests that some people are annoyed at the presence of aircraft *per se*, even though they have not encountered one.

Previous studies have not adequately addressed the relationship between attitude and reported effects of aircraft. This factor may influence visitors' responses to questions about aircraft overflights.

3.2 EXPECTATIONS

Satisfaction with recreational experiences has been firmly linked to expectations (Moore 1995) suggesting that those who expect to experience aircraft are less likely to be adversely affected by their presence. The present study suggests an inverse relationship between expectation of aircraft and adverse effects (the greater the expectation, the lesser the annoyance and vice versa). However, as this research question was not explored in any depth, conclusions are speculative.

International visitors can be differentiated from their New Zealand counterparts, in part, on the basis of expectation. For example, some European visitors acknowledge and tolerate the presence of aircraft as they are part of the 'mountain scene' in their home countries.

3.3 PREVIOUS VISITS AND BACKCOUNTRY EXPERIENCE

Studies in the US indicate that first time visitors to a site are less sensitive to aircraft impacts than frequent visitors (NPS 1994). This phenomenon has been described as the 'Last Settler Syndrome', whereby people revisiting a site are sensitive to changes that have occurred since their previous visit (Nielsen et al. 1977). Their visit satisfaction is linked to expectations established during previous visits. As aircraft activity in most sites has increased over time, it may be speculated that frequent visitors are more likely to be negatively affected by aircraft.

Respondents interviewed in this study who felt aircraft were not affecting them, frequently noted that a problem would occur if a greater number of aircraft were present. This phenomenon is likely to be related to cognitive dissonance (not wanting to acknowledge your experience was imperfect) and the Last Settler Syndrome, mentioned above.

While no conclusions about the relationship between level of backcountry experience and impacts of aircraft overflights can be drawn from this study, a positive correlation is likely. This is supported by the observation that guided walkers (who are less experienced backcountry visitors generally) appeared less effected by aircraft.

3.4 ACTIVITY

The activity being undertaken at the time of aircraft presence has been investigated by US studies and no statistically significant relationship found between activity and annoyance (Fidell et al. 1992). Differences were noted, however, between backcountry and frontcountry visitors' reactions to aircraft, with backcountry visitors being more sensitive (NPS 1994). The reasons for these differences were not investigated, although the authors commented that different types of visitors seek different experiences.

The present study suggests that a more relevant factor than activity may be the amount of effort involved in reaching the place where aircraft are experienced. Those who made an effort to get to a natural setting (e.g. a multi-day walk) were more likely to have strongly held negative views about aircraft.

3.5 SETTING

Previous aircraft-related studies clearly demonstrate the site-specific nature of aircraft effects (NPS 1994). Recreationists' reactions to aircraft at one site cannot be extrapolated easily to another site. It is unclear what site attributes influence the impacts from aircraft overflights, other than the obvious factor of level and nature of aircraft activity (NPS 1994). It is likely that a complex interaction of site attributes influences the level of impact.

This study found a greater acceptability of aircraft in modified environments (e.g. close to Mount Cook village) than in natural settings, when the aircraft is the only non-natural part of the landscape. For example, some guided walkers on the Milford Track indicated that the aircraft only annoyed them when they were walking on the track—and not when they were in their accommodation quarters. The American National Park Service study (1994) notes that sites which are less easily accessed may attract more sensitive groups of visitors.

3.6 NATURAL QUIET

The difference between non-natural sounds and natural ambient sounds, usually termed *natural quiet*, was clearly demonstrated by some respondents in the present study. Despite natural noises, such as waterfalls and avalanches, being extremely loud in some instances (louder than aircraft overflights), many people viewed these noises as 'good' and aircraft noise as 'bad'. US studies have found that the enjoyment of natural quiet is an important reason for visiting national parks—about as important as viewing scenery (NPS 1994).

Aircraft are not necessarily the most disturbing non-natural noise however. During interviews on the Milford Track a rock drill was in use by track workers. Respondents noted that this noise was more intrusive than aircraft noise. Similarly, at the Mount Cook campground some respondents were more disturbed by loud talking and radios than aircraft.

The non-aircraft sound levels at a site appear to influence visitors' reactions to aircraft noise although insufficient data are available to support or refute this hypothesis (NPS 1994).

3.7 PURPOSE OF FLIGHT

Interview respondents had quite different reactions to aircraft dependent on the nature of the flight. Generally, search and rescue missions were accepted and indeed welcomed by many. Many people also accepted the need for servicing flights, especially when they were utilising these services (e.g. gas supplies). Scenic flights were perceived as 'unnecessary' by many and some strong opinions were expressed about them.

This study was unable to identify whether the propensity to take a scenic flight influenced people's reactions to aircraft. A simple relationship was not obvious. Previous studies have not investigated this factor.

3.8 ENTERTAINMENT VALUE

Some people mentioned the positive entertainment and novelty value of aircraft flying overhead or landing. These comments were particularly directed towards helicopters and related to their interest in seeing a helicopter. This was particularly evident on the Milford Track.

3.9 TIME

Previous research has indicated that people's reported levels of annoyance decrease as time elapses from the aircraft encounter (USDA 1992). Generally, studies have attempted to measure annoyance as close as possible to the time of exposure to aircraft. Attempts to measure the time-lapse phenomenon during the present study were not successful and further research is suggested.

A key determining factor in the development of the monitoring method which was the objective of this research, has been the requirement for a logistically simple method. Given the nature of park settings, the method attempts to obtain recreationists' reactions as soon as is reasonably possible after the aircraft contact, and while visitors are still within the natural setting.

3.10 AIRCRAFT TYPE AND FLIGHT DETAILS

While it is clear that some aircraft are noisier than others, the impact from different types of aircraft (particularly differences between helicopters and fixed wing aeroplanes) is difficult to discern. Some managers differentiate between the two and generally perceive helicopters to be less intrusive. Respondents held widely diverse views. Many visitors did not differentiate between helicopters and fixed-wing aeroplanes in terms of effect.

Proximity of the flight to the recreationist, flight path, nature of aircraft manoeuvring (turns, acceleration, etc.) and the nature of the terrain all effect the noise generated by an individual aircraft. These factors create an extremely complex noise-generating situation and work is ongoing in the US to model the effect of these variables on visitor impacts.

3.11 SUMMARY

Recreationists' reactions to aircraft are likely to be influenced by their:

- Attitude towards aircraft in parks: if they do not want aircraft in parks *per se*, then they are more likely to be annoyed with aircraft
- Expectations of aircraft activity: the greater the expectation of aircraft presence, the lesser the annoyance
- Previous visits and backcountry experience: first time visitors are likely to be less sensitive to aircraft; frequent backcountry visitors are likely to be more annoyed
- Activity: the greater the effort involved in reaching an area, the greater the likelihood of annoyance with aircraft
- Setting: aircraft appear more acceptable in modified environments and less acceptable in natural environments
- Perception of the purpose of the flight: scenic flights are more likely to be annoying, while rescue flights are more likely to be acceptable
- Perception of aircraft as entertainment: some people consider aircraft activity as entertainment
- Proximity to the aircraft.

4. Concepts and definitions underlying the monitor

4.1 MONITORING PRINCIPLES

The aim of any monitor is to assess change over time. The replication of method is crucial to achieve this aim and, for this reason, the method presented in Part 1 should be followed as exactly as possible. Otherwise change in results over time may reflect the alteration in method rather than a change in the object being measured.

For logistical reasons the method is simple. It therefore includes *primary* effects of aircraft on recreationists but does not measure *all* effects. While it is tempting to include a wide range of specific measures, the monitor is carefully built on people's reaction to aircraft generally. Investigation of specific factors such as noise, purpose of flight, type of aircraft, or the intention to take a flight, is the subject of further research.

Given the range of factors which appear to influence reactions to aircraft, it follows that any significant change to these variables may alter reactions to aircraft. For example, if the nature of the activity undertaken by visitors within a park alters considerably, then levels of annoyance with aircraft may change.

4.2 WHAT IS BEING MEASURED?

The monitor presented in this report measures the effects of aircraft on recreationists in a particular way. It is therefore important to understand what is being measured.

4.2.1 Defining annoyance

The predominant response to aircraft in this study was negative. In describing the effect of aircraft upon them, recreationists used words such as: annoying, irritating, intrusive, distracting, disruptive. This report uses the term *annoyance* as it appears to encapsulate the words used by visitors and has been used frequently in previous studies.

A distinction is clear between annoyance with aircraft and aircraft effects on recreationists' total visit experience. In this study, as with overseas work (Fidell et al. 1992), no clear relationship is apparent between visit enjoyment and annoyance with aircraft. We believe they measure different things.

The US National Park Service (1994) asked visitors about interference with their enjoyment of the park and interference with their appreciation of the natural quiet and the sounds of nature. In all parks studied, the interference with natural quiet was greater than the interference with their overall enjoyment.

For some people interviewed in the present study, the nature of annoyance with aircraft appeared to be similar to reactions to sandflies—a short-term

annoyance that disappears as soon as the insects do. No respondents indicated that aircraft ruined their visit.

The monitor deals with this difference between annoyance and dissatisfaction with the visit by collecting information separately on aircraft effects on respondents' total visit enjoyment, and their annoyance with aircraft specifically.

4.2.2 Rationalisation

Some recreationists rationalised or modified their reactions based on their acceptance of aircraft within the setting. Put simply, some people indicate that they are not adversely affected by aircraft yet would prefer no aircraft. Several factors are influential. First, recreationists differentiate between different flight purposes. They are generally accepting of search and rescue and management-related flights, whereas scenic flights were considered unnecessary by many. Second, an 'unselfish attitude' is evident amongst many visitors. People tempered their personal desires by an understanding of the needs of others—especially those who cannot enjoy natural places on foot owing to age, disability or infirmity.

A link between aircraft acceptance level and impact is likely. If the flight is considered acceptable, then negative impacts are lessened.

The reactions measured by the monitor include this 'acceptance' factor which has already modified the respondent's reaction to aircraft. This should be remembered when analysing monitoring data. Those who record no annoyance may still prefer no aircraft.

4.2.3 The measurement of noise

The measurement of aircraft noise has been used in previous studies in an attempt to correlate aircraft activity with visitors' reactions (dose-response studies). Different noise measurements have been used, including aircraft sound levels (and ambient sound levels), length of time aircraft are audible, frequency of flights, and speed of onset (sometimes called 'startling'). The literature is not conclusive in terms of the most appropriate or meaningful measures. Respondents in this study indicated that primary effects were related to flight frequency and sound levels. Previous studies have shown that the reports of impacts from aircraft increase with increasing exposure to aircraft sound (NPS 1994).

For a small number of people interviewed in this study, the presence of aircraft *per se* was an impact irrespective of the nature of the aircraft activity. For these people, the critical impact factor is the presence of aircraft rather than frequency or sound level.

The principle of the monitoring system is the measurement of visitor reactions. Where it is possible, however, the frequency of aircraft activity will be related to visitor reactions. The monitor records aircraft activity via existing aircraft flight records to give the number of overflights during the days on which the survey is undertaken. However such records will only be available for some monitoring areas.

5. Evaluating potential approaches

5.1 CHOICE OF METHOD

5.1.1 Indirect methods

Indirect data collection techniques (such as hut book records, complaints received, conversations with staff, and submissions to planning documents) were considered for the monitoring method and soon dismissed as primary methods for use as a monitor. Examination of these methods suggests that they are poor monitoring tools as only a very small proportion of people utilise these means to comment on aircraft. However, indirect methods may be useful indicators to identify areas where monitoring should be undertaken.

5.1.2 Direct methods

A range of direct methods could be used to assess recreationists' reactions to aircraft. Direct methods ask recreationists about their reactions to aircraft. Potential methods include self-completed diaries, questionnaire surveys and in-depth interviews. These methods have the benefit of providing detailed information about people's reactions. This is necessary for monitoring purposes.

Previous studies into aircraft impacts overwhelmingly utilise questionnaires to collect data from visitors, primarily via on-site interviewer-administered questionnaire surveys. Some forms of post-visit questionnaires have also been used—telephone surveys and postal questionnaires. Little experience with other techniques was available from the literature. We suggest that diaries are worthy of further attention and could be a useful method for any further research in this area. Diaries provide the ability to record visitors' immediate reactions to aircraft (as it happens), but have the disadvantage of a loss of control over the data which may result in fictitious data and non-response. These problems could be controlled by researchers on site.

A self-completion questionnaire was chosen as the monitoring method because of the ease of administration and replication, and relatively light burden on visitors.

5.2 DEVELOPING THE QUESTIONNAIRE

5.2.1 Specific versus general questions

Questions can ask directly about aircraft, or about general satisfactions and dissatisfactions with the visit. People evaluate their responses to an event much more reliably if they are questioned specifically about the event (NPS 1994). However, satisfactions with aircraft are only one part of the visitor's overall satisfaction with their visit and only one factor that affects the visitor's overall

enjoyment. Therefore a wide range of responses is likely to any question about general (dis)satisfaction.

This study addressed this issue by taking a dual approach. We believe that the two approaches produce different information—both of which are relevant and useful. Thus the questionnaire includes questions about general (dis)-satisfactions as well as specific aircraft-related questions.

5.2.2 Reported aircraft activity threshold

In order to address the question of *How much aircraft activity is too much?*, this study investigated whether respondents could identify a threshold level of acceptable aircraft activity. In mind was the opportunity to monitor the threshold level over time. Reported thresholds varied widely between respondents. On the Milford Track different recreationists reported maximum acceptable thresholds from three to fifty flights per day—a large variation. Therefore this approach was modified to identify the proportional increase in aircraft activity that respondents felt acceptable.

5.2.3 Measures of annoyance

The literature was scanned to assess what measures may be reliable predictors of aircraft annoyance. American studies (NPS 1994; Fidell et al. 1992) did not find any of the measures they examined to be useful predictors (including frequency of visit to the site, intention to return to site, activity undertaken, aircraft type noticed, visitor characteristics).

Within previous studies, the measurement of visitor annoyance has usually been via semantic differential scale questions, e.g. a scale from slightly annoyed to very annoyed. These vary from those focused only on negative effects (e.g. slightly annoyed to very annoyed) to those encompassing both positive and negative effects (e.g. enjoyed to disliked).

5.3 FIELD TESTING THE QUESTIONNAIRE

The questions were derived with the principle of simplicity in mind. The purpose of the questions is to monitor effects and, to this end, only selected measures are used.

A draft questionnaire was developed and tested in the field. The questionnaire utilised question formats from previous studies where appropriate (Fidell et al. 1992; Oliver 1995; Rogers 1995). It included a variety of questioning approaches and question designs to judge how well the questions measured what was intended. Question comprehensibility was also assessed. This work was undertaken by administering the questionnaire and then conducting interviews with respondents, talking through each question in detail and discussing in depth their reactions to aircraft. This approach was extremely fruitful and is recommended to future researchers.

5.4 MEASURING AIRCRAFT ACTIVITY

The measurement of aircraft activity as part of the monitor presents several methodological issues. First, there are difficulties in measuring the level and type of aircraft activity in a meaningful way. The only reliable method is via the use of sound recording equipment—equipment which is expensive and therefore not feasible for a logistically simple and low cost monitor. A different approach is to record aircraft using personal observation methods (for example recording the frequency of flights). Personal observation has been used in previous New Zealand studies (most thoroughly by Oliver 1995). This method proved flawed in that the parameters measured (aircraft height, direction, aircraft type) did not adequately account for the sound level of the aircraft heard on the ground (G. Oliver pers. com. 1995). Aircraft manoeuvres also influence sound levels, for example, flying speed, ascents and descents, tilting wing tips (to provide views) and so on (G. Oliver pers. com. 1995). The plethora of flight details required in order to measure aircraft noise validly makes personal observation of aircraft difficult to operationalise. Furthermore, the relationship between these data and visitor reactions is complex and would present analytical difficulties. In addition, both sound recording equipment and personal observation are limited to the locations where the equipment or the observer is located, which does not necessarily correspond with visitors' locations except for geographically restricted sites. A third approach is to utilise existing records of flights as a measure of aircraft activity. While this may be feasible in some areas, in many it is not, particularly where overflight patterns are complex and there are no readily identifiable airports for the area.

The second methodological issue is a conceptual one. As noted earlier, previous studies which have measured aircraft activity have focused on dose-response studies. Their purpose has been to establish a correlation between aircraft activity (however measured) and visitor reactions, and so allow prediction of visitor reactions based on knowledge of aircraft activity. This work has shown that correlations are site specific. The dose-response exercise therefore needs to be undertaken at each site before any predictability is achieved. This work is beyond the scope of a simple monitor.

Given this site-specific requirement, as well as the costs and methodological difficulties in collecting data in the field to measure aircraft activity, this monitor utilises existing flight data. While this approach will not assist those areas where collating flight records is too complex to be meaningful, it will be applicable to many of the high-use aircraft areas, where scenic flights are primarily undertaken by a small number of operators from a limited number of airports.

This decision removes the possibility of establishing detailed prediction models for individual sites. This work could be undertaken independently of the monitor using sound recording equipment. For areas where aircraft data cannot be collated, the monitor relies on the data collection being undertaken year to year during the same time period. The comparison across sites is not appropriate in any statistical way because of the site specific nature of aircraft activity and the likelihood that some recreationists' reactions are also site specific. For example, Mount Cook, a national icon, appeared to engender responses different from those expected at other sites.

6. Research prospects

Throughout this report, areas worthy of further research have been identified. These research needs are summarised in this section.

1. Research is required to explain the relationship between aircraft overflight impacts and:
- Self-selection and displacement
- Attitudes to aircraft generally and expectations of experiencing aircraft
- Previous visits to the site and previous backcountry/park experience
- The setting in which the overflights are experienced and the effort involved in reaching the site
- The propensity to take a scenic flight.

2. Research is required to explain the relationship between annoyance with aircraft overflights and enjoyment, in order to set aircraft annoyance in context.

3. Research is required to explain the association between visitor impacts and aircraft sound levels. Previous research has indicated a relationship exists, albeit a complex one.

4. Research is required to link visitor impacts with Recreation Opportunity Spectrum zones and so extend the usefulness of this planning tool.

7. Summary

The primary effects of aircraft overflights on recreationists are related to aircraft noise. Many factors influence recreationist's reactions to overflights, and further research is required to explain the relationship between site attributes and visitor characteristics, and impacts from overflights on recreationists.

Direct questioning of visitors is the best approach to monitor visitor reactions to aircraft overflights. Both specific aircraft-related questions and general satisfaction questions are suggested. Questions about enjoyment and annoyance with aircraft provide different measures of the effects of overflights on recreationists.

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Appendix 1

Questionnaire

The questionnaire was prepared as a Word for Windows document. Before printing, insert the name of the monitoring area in [NAME AREA] and ensure questionnaire return instructions at the bottom of the questionnaire are included and correct. Photocopy the questionnaire double-sided onto A4 paper or light card and then fold each sheet to A5 size. Fill in the questionnaire code and date prior to administering the questionnaire.

8 **How much have the aircraft annoyed you? Please circle the number that best describes your answer.**

1 2 3 4 5 6 7

Hardly annoyed at all — Extremely annoyed

9 **How much have the aircraft detracted from your total enjoyment of this visit to [NAME AREA]? Please circle the number that best describes your answer.**

1 2 3 4 5 6 7

Didn't detract at all — Ruined my visit

Thank you for your time!

Please hand this questionnaire back to the person who gave it to you [or other instructions for questionnaire return]

Code:

Date:

VISITOR SURVEY

Thank you for your time.
These questions ask about your visit to [NAME AREA].
Please think about your current visit to [NAME AREA] when answering all questions.

1 **What have you liked <u>the most</u> about your visit to [NAME AREA]?**

_____

_____

_____

2 **What have you liked <u>the least</u> about your visit to [NAME AREA]?**

_____

_____

_____

3 Have you noticed any aircraft during this visit? By aircraft we mean both helicopters and aeroplanes.

1❒ Yes

2❒ No

If NO then stop here. Thank you for your time.
If YES then please continue.

4 What number of aircraft have you noticed on this visit? Count each aircraft fly-over separately even if it was the same plane.

_____

5 Has the amount of aircraft activity you've noticed on this visit been:

1❒ **Less** than what you expected on this visit

2❒ **More** than you expected

3❒ About **the same** as you expected

4❒ You didn't know what to expect

6 What amount of aircraft activity would impair your visit to [NAME AREA]?
Please tick only one box.

1❒ Any aircraft activity at all would impair my visit

2❒ The amount I've noticed this visit (my visit has been impaired)

3❒ Double the amount I've noticed this visit

4❒ Five times the amount

5❒ More than five times the amount

7 How have the aircraft affected you during this visit? Please tick only one box.

1❒ I enjoyed them

2❒ Neutral (I neither enjoyed them nor was I annoyed by them)

3❒ I was annoyed by them

4❒ I don't know

If you ticked I WAS ANNOYED BY THEM, then please answer the rest of the questions. Otherwise please stop here. Thank you for your time.

Appendix 2

Aircraft activity record sheet

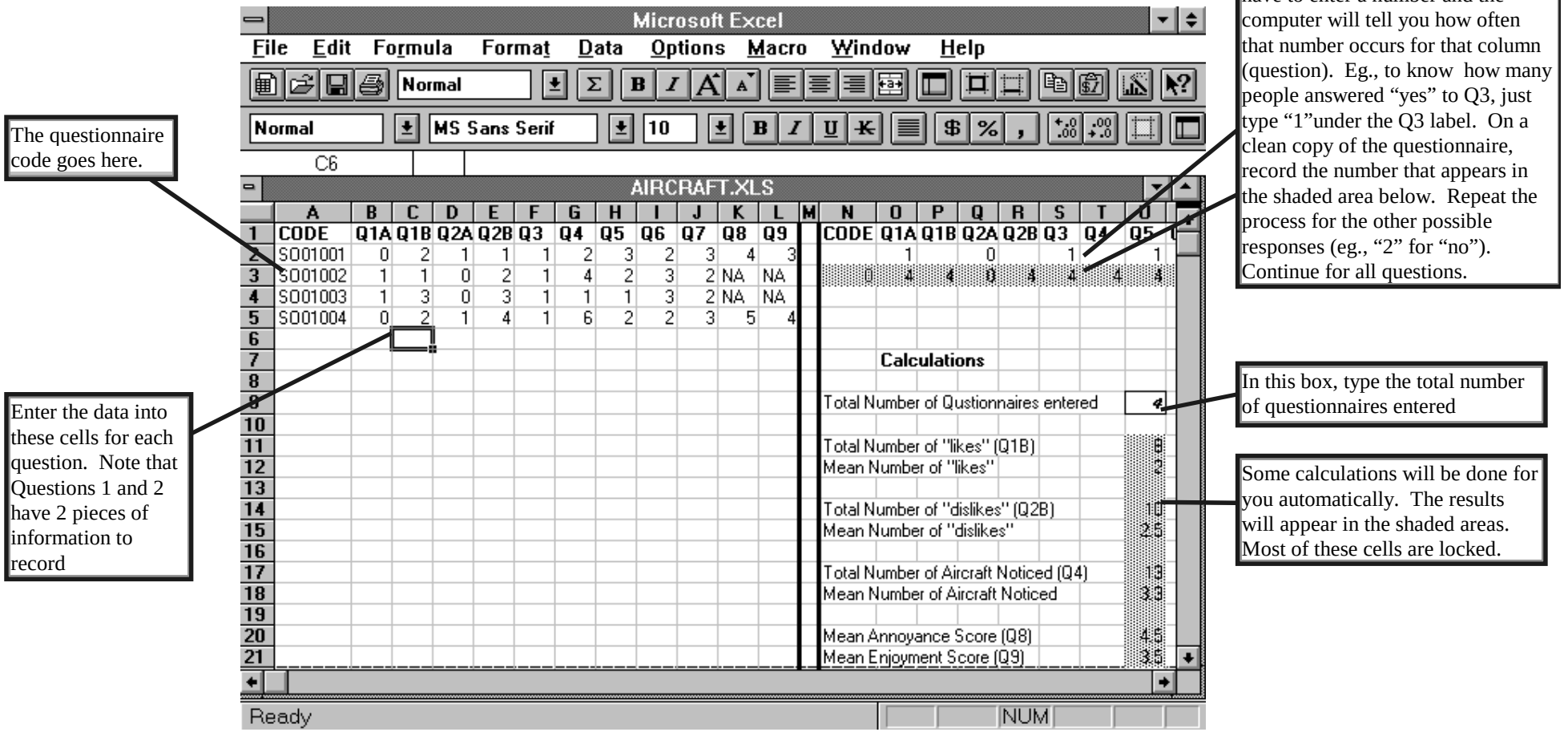
Record the aircraft movements relevant to the monitoring site(s) for the days on which surveying takes place. Record the number of flights by aircraft type. These data may be obtained from airline companies or from airport authorities.

Example:

DATE	TYPE OF AIRCRAFT	NUMBER OF FLIGHTS
6 March 1998	Squirrel	6
(9 am–5 pm)	Twin Otter	1
	Cessna 185	2
	Hughes 500	1
7 March 1998	Twin Otter	3
(9 am–1 pm)	Squirrel	2
9 March 1998	Hughes 500	7
(1 pm–5 pm)	Cessna 185	2

Appendix 3

Spreadsheet model for data from questionnaires



- Be sure to enter "NA" whenever there is no response, or if an answer is ambiguous. There should be an entry in each cell of the spreadsheet.
- This spreadsheet model has been generated using Excel 4.0 for Windows.

Appendix 4

Mock-up of a monitoring report

This report uses fictional data to show the type of results that will be obtained from the application of the monitoring method. The scenario created for this illustration is a monitoring programme on the Milford Track, where monitoring is undertaken during one period each year. There are two different monitoring sites (Quentin Hut to represent guided walkers and Dumpling Hut to represent independent walkers). Two years worth of data are presented in this report. In each subsequent year, additional data will be added to the report.

If more than one monitoring period is used for the monitoring area, then treat each period separately for the analysis. In other words, you would repeat each of the analyses written up below for each time period separately. The different sites, however, are added together to give an area total.

In all sections, a brief paragraph describes the main findings and data are then presented in tables and graphs. The data are taken directly from the Excel spreadsheet (see Appendix 3). Note that the figures used in this mock-up monitoring report do not correlate with the figures presented in the mock-up spreadsheet in Appendix 3. In reality, they would. The graphs were generated in Excel and are optional. Additional information may be added into the report where relevant, for example, observations of the survey administrators.

MOCK-UP REPORT ON THE MILFORD TRACK AIRCRAFT EFFECTS MONITORING PROGRAMME FOR 1998

This is the second aircraft monitoring report for the Milford Track. Two years worth of data are now available.

Method

In 1998 monitoring was undertaken in the first week of January, replicating 1997. To collect the required 400 questionnaires, the hut warden at Dumpling Hut and the hut manager at Quentin Hut distributed them to visitors on three evenings (January 2, 3, 4) until they had the target number required. A total of 406 questionnaires were collected, 186 questionnaires from Dumpling Hut (independent walkers) and 220 from Quentin Hut (guided walkers). This is in rough proportion to the number of independent walkers compared with the number of guided walkers.
The track was fully booked during this period, as experienced during last year's monitoring. Aircraft activity was recorded from the Milford airport records - see the attached Aircraft Activity Record Sheet. It was a busy aircraft period.

Aircraft in Context (Q1 and Q2)

Likes

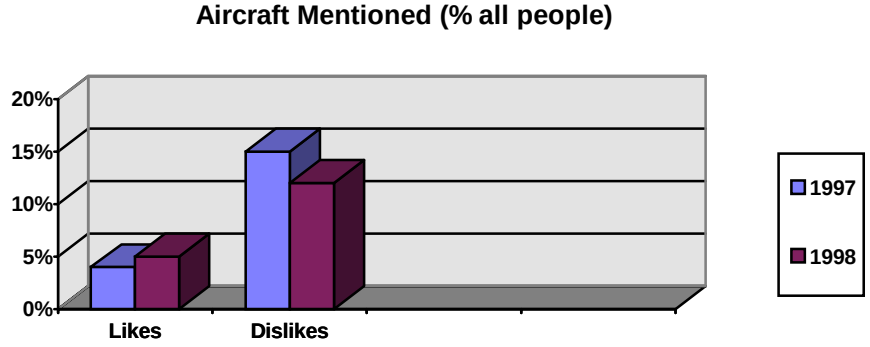
Twenty people noted aircraft as something they liked most about their visit to the Milford Track. This represented 5% of all people questioned and less than 1% of all 'likes' mentioned. An average (mean) of 3.2 likeable things were mentioned. These figures have risen slightly since 1997 but fall within the error margins for the figures (+/- 5%), so may not represent any real change.

	Aircraft mentioned (n)	All people	All mentions	Mean
1997	15	4%	1%	3.5
1998	20	5%	<1%	3.2

Dislikes

Fifty people noted aircraft as something they liked least about their visit. This was 12% of all people questioned and 3% of all 'dislikes' mentioned. An average (mean) of 4.1 things were mentioned. These results are slightly lower than 1997, and may not represent a real change given the error margin of +/- 5%.

	Aircraft mentioned (n)	All people	All mentions	Mean
1997	58	15%	3%	5.0
1998	50	12%	3%	4.1



Aircraft Noticed by Visitors (Q3; Q4)

Three hundred people (74%) had noticed aircraft during their visit (and so continued to answer the rest of the questionnaire).

Most people noticed 20 - 30 aircraft on their visit. The mean number of aircraft noticed was 14. Fewer people noticed aircraft and fewer aircraft were noticed in 1998 than in 1987. No obvious explanation is apparent as a similar amount of aircraft activity was recorded each year.

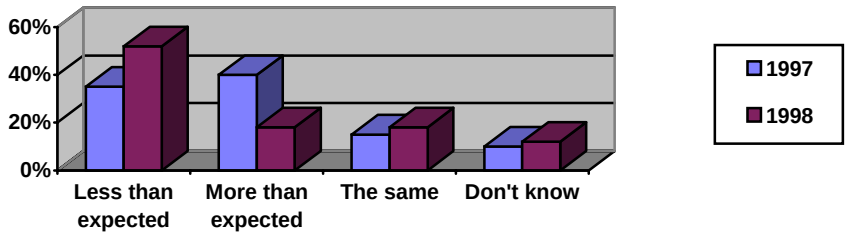
Compare these data with aircraft activity records where these are available.

	Noticed aircraft	Mean
1997	85%	22
1998	74%	14

Amount of Aircraft Activity Noticed (Q5)

Just over half of all people who noticed aircraft said there were fewer aircraft than they expected. Similar numbers of people stated that there were more aircraft than they expected to those who stated there were similar numbers of aircraft to what they expected. These figures are substantially different to 1997 results. Between the two years, the expectations of seeing aircraft has risen.

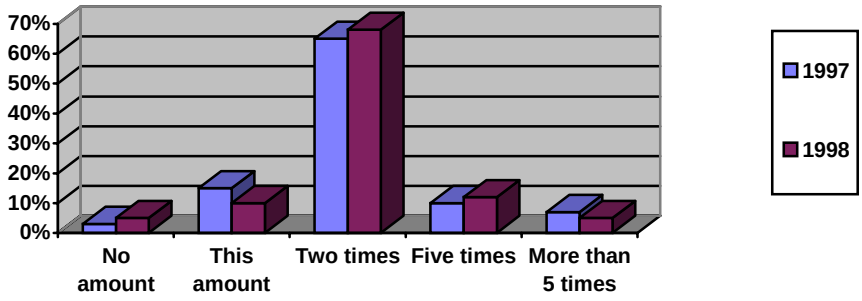
	Less than expected	More than expected	The same	Don't know
1997	35%	40%	15%	10%
1998	52%	18%	18%	12%



Amount of Aircraft Activity that Would Spoil their Visit (Q6)

Most people said that double the amount of aircraft activity that they had experienced would ruin their visit. These figures have changed little compared with 1997.

	No amount	This amount	Two times	Five times	More than 5 times
1997	3%	15%	65%	10%	7%
1998	5%	10%	68%	12%	5%

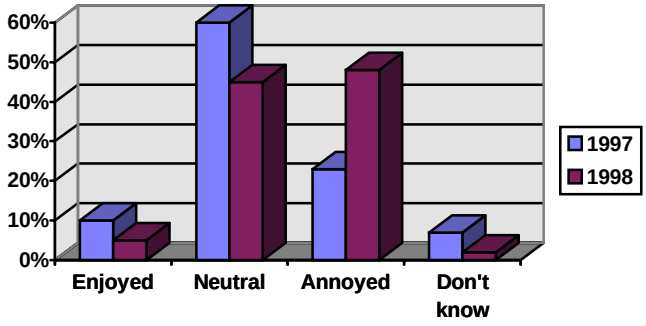


Effect of Aircraft (Q7)

Similar numbers of people said they felt neutral about the aircraft activity as said they were annoyed by them. A small number of people enjoyed the aircraft. These figures show a large increase in the number of people annoyed by aircraft since 1997.

* If a threshold level of annoyance has been agreed, then this should be compared with the results. For example, '25% of people annoyed' may be agreed as a threshold level of annoyance - in which case, this level was reached in 1998, suggesting that action is required.

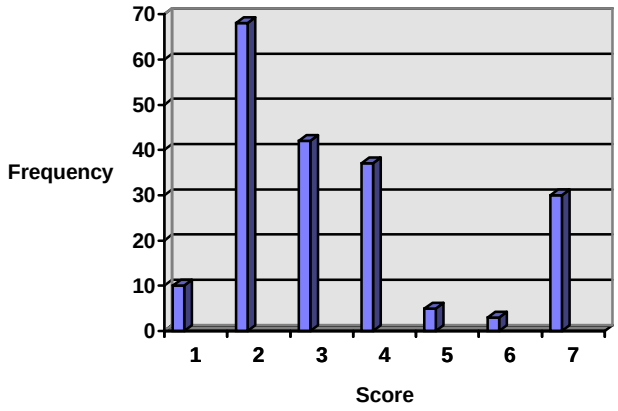
	Enjoyed	Neutral	Annoyed	Don't know
1997	10%	60%	23%	7%
1998	5%	45%	48%	2%



Amount Annoyed by Aircraft (Q8)

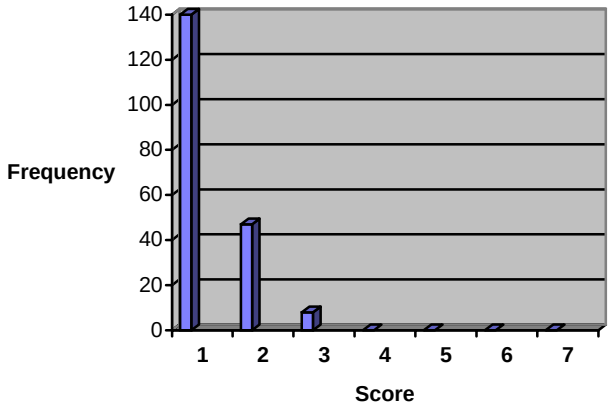
Of the 48% of people who said they were annoyed by aircraft, the mean score for annoyance was 3.5. This represents a core group of people who said they were extremely annoyed (scored 7 on the 7 point scale) with the bulk of others indicating the scores of 2, 3 and 4.

* A score of 4 or more would indicate that, on average, people were 'strongly' annoyed by the aircraft.



Amount Aircraft Detracted from Enjoyment of Visit (Q9)

Of the 48% of people who said they were annoyed by aircraft, the mean score for detracting from their visit was 1.3. This low score suggests that aircraft did not particularly detract from people's visits. It shows that people as a group felt annoyed by the aircraft more than they felt the aircraft detracted from their total visit (i.e. 3.5 > 1.3).



Conclusion

In 1998 the annoyance threshold (as measured by Q7) was reached.

Appendix 5

Error margin calculation

To calculate the error margin for data, plug the total number of questionnaires collected (called **n**) in to the formula below.

Error margin = $1.96 \times \sqrt{(0.25 / n)}$

Multiply this figure by 100 to turn it into a percentage

Technical Note

This calculation assumes that the question has only two possible responses (a Yes/No type question). While not technically correct, it is common practice to use this formula for questions with more than two possible responses. The division of responses across the possible response categories affects the error margin. A conservative approach (the worst case scenario) has been used in this formula.